



“Gheorghe Asachi” Technical University of Iasi, Romania



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## LEACHING PROPERTIES OF LEAD PASTE IN SPENT LEAD-ACID BATTERY WITH A HYDROMETALLURGICAL PROCESS AT ROOM TEMPERATURE

Xinfeng Zhu<sup>1,2</sup>, Lei Li<sup>1</sup>, Jianwen Liu<sup>1</sup>, Ramachandran Vasant Kumar<sup>3</sup>, Jiakuan Yang<sup>1\*</sup>

<sup>1</sup>Huazhong University of Science and Technology (HUST), School of Environmental Science and Engineering, 1037 Luoyu Road, Wuhan, 430074 Hubei, P.R.China

<sup>2</sup>Henan University of Urban Construction, Pingdingshan, 467000 Henan, P.R.China

<sup>3</sup>University of Cambridge, Department of Materials Science and Metallurgy, Cambridge, CB2 3QZ, UK

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### Abstract

In this study, as part of developing a green recycling process of spent lead-acid battery that can avoid both smelting and electro-winning, leaching agent citric acid and other additives (such as sodium citrate and hydrogen peroxide) in aqueous media were reacted with spent lead-acid battery paste. PbO, PbO<sub>2</sub> and PbSO<sub>4</sub>, which are the three main components in a spent lead-acid battery paste, were leached to form lead citrate precursor which was crystallized and then separated from the solution. Reaction between spent lead-acid battery paste and citric acid based reagents at the pH of 3~4, yielded lead citrate, Pb(C<sub>6</sub>H<sub>6</sub>O<sub>7</sub>)·H<sub>2</sub>O, which was characterized by XRD, SEM and FT-IR analysis. The optimal conditions for leaching spent lead-acid battery paste at room temperature were found to be: 2.19 mol L<sup>-1</sup> of C<sub>6</sub>H<sub>8</sub>O<sub>7</sub>·H<sub>2</sub>O, 1.29 mol L<sup>-1</sup> of Na<sub>3</sub>C<sub>6</sub>H<sub>5</sub>O<sub>7</sub>·2H<sub>2</sub>O solution, 1/5 as the starting ratio of spent lead-acid battery paste to water (S/L) and reaction time of 8 h. The results showed that up to 98 % of lead from spent lead-acid battery paste was converted to the lead citrate under the optimal conditions.

*Key words:* hazardous waste, lead citrate, lead paste, recovery, spent lead-acid battery

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\* Author to whom all correspondence should be addressed: E-mail: [jkyang@mail.hust.edu.cn](mailto:jkyang@mail.hust.edu.cn); [yjiakuan@hotmail.com](mailto:yjiakuan@hotmail.com); Phone: +86-27-87792207; Fax: +86-27-87792101